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VAN PELT, YI & JAMES LLP
10050 N. FOOTHILL BLVD #200
CUPERTINO, CA 95014

EXAMINER	
EJAZ, NAHEED	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/666,952	CHOI ET AL.
	Examiner	**Art Unit**
	Naheed Ejaz	2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-9 and 12-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-9 and 12-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1,4-9, 12-28 have been considered but are moot in view of the new ground(s) of rejection.

2. Applicant argues, 'Neither Felix et al, nor Yoshida, alone or in combination, describe "convolutionally encoding data to be transmitted over the wireless channel; repetition encoding the convolutionally encoded data, wherein repetition encoding is performed in the frequency domain' (Remarks, dated: 07/16/07, page # 6, paragraph # 3, lines 15-18). This is not persuasive since Felix teaches convolutional encoder and transmits data over the wireless channel (figures 1 & 2, elements 117, 119 & 212, col.4, lines 17-67, col.5, lines 1-4) (see also claim 1 rejection below).

3. Applicant argues, 'In figure 1 of Pauls, transmitter 10 includes convolutional encoders 12 and 16, In Figure 12 of Yoshida, a repetition encoder 81A is shown in parallel with a convolutional encoder 82A' (Remarks, dated: 07/16/07, page # 7, paragraph # 3, lines 10-12), 'Neither Pauls nor Yoshida (alone or in combination) describe 'processing the received convolutionally encoded and repetition encoded data', 'combining the repetition encoded data to produce combined data; and decoding the combined data' (Remarks, page # 7, paragraph 3, lines 13-14, 16, 17-18). This is not persuasive since Pauls in combination with Yoshida teaches processing the received convolutionally encoded and repetition encoded data. Yoshida teaches two encoders convolutional and repetition but in parallel and can be connected in series depending on ones' design choice as shown in Pauls reference in which two convolutional encoders

are connected in series. Therefore, it would have been obvious to one of ordinary skill in the art, at the time invention was made to replace one of Pauls convolutional encoder by Yoshida's repetition encoder in order to simplify encoding process and maintain high BER and thus provide high efficiency for the system as taught by Yoshida (col.3, lines 42-49). Furthermore, Yoshida teaches combiner and decoder (figure 12, element 95 & figure 6, element 42).

Response to Amendment

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 5, 7, 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Felix et al. (5,946,356) (hereinafter Felix) in view of Yoshida (5,953,377) and further in view of Walton et al. (7,002,900) (hereinafter, Walton).

6. As per claim 1, Felix teaches, 'convolutionally encoded data to be transmitted over the wireless channel' (figure 2, elements 212 & 214, col.4, lines 17-67, col.5, lines 16-25). Felix teaches repetition of the convolutionally encoded data (claimed repetition the convolutionally encoding data) (figure 2, elements 212, 214 & 215, col.5, lines 26-31).

Felix does not teach repetition encoder.

Yoshida teaches a repetition encoder 81 (figure 9) which has 1/r rate associated with repetition encoding process (col.9, lines 46-51) (claimed repetition encoding).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Yoshida into Felix in order to optimize BER performance over a fading channel, with a high efficiency and reasonable delay as taught by Yoshida (col.3, lines 41-49) by successively generating r-bit code words by using repetition encoding circuitry (col.9, lines 46-51) thus enhance system performance.

Felix and Yoshida do not teach repetition encoding is performed in the frequency domain prior to processing by an Inverse Fourier Transform (IFFT).

Walton teaches repeater 216 that is connected in series with convolutional encoder 216 (figure 2). Repeat 218, repeats code bits which are in frequency domain (col.1, lines 29-35, col.4, lines 50-62) (claimed repetition encoding is performed in the frequency domain prior to processing by an Inverse Fast Fourier Transform (IFFT) since repetition encoding of the claim performs repetition of bits in the light of Specification (page # 2, paragraph # 0020, col.2, line 6)). Walton teaches that the data from Repeat 218 is being processed by IFFT 812 (figure 8) which is included in modulators 126a-126d (figures 2 & 8, col.17, lines 31-54) (claimed 'processing the repetition encoded data using the IFFT, wherein frequency domain information is transformed into time domain information). Walton teaches a transmitter 820 to transmit time domain information which reads on claim limitations 'transmitting the time domain information over the wireless channel' (col.17, lines 50-54).

It would have been obvious to one of ordinary skill in the art, at the time of invention was made, to implement the teachings of Walton into Felix and Yoshida in order to maximize diversity for the data transmission and achieved robust performance as taught by Walton (col.1, lines 49-56).

7. With respect to claim 5, Felix teaches, 'masking a data by applying a pseudorandom sequence' (figure 2, element 'PN Generator' which has functional equivalency to claim limitations of masking the data by applying a pseudorandom sequence).

8. As per claim 7, Felix discloses, 'the data is interleaved after repetition encoding whereby a need to pad the data prior to interleaving is reduced' (figure 2, element 216, col.5, lines 27-50).

9. As per claim 21, in addition aforementioned rejection of claim 1, Felix teaches, 'a convolutional encoder configured to convolutionally encode data to be transmitted over the wireless channel' (figure 2, elements 117, 119, 212, col.4, lines 17-67, col.5, lines 16-25), 'a repetition encoder configured to repetition encode the data' (figure 2, element 220, col.5, lines 51-63).

10. As per claim 22, Felix discloses, 'an interleaver' (figure 2, element 216).

11. As per claim 23, Felix teaches, 'a masking processor configured to superimpose a pseudorandom mask on the repetition coded data' (figure 2, element 'PN generator', col.5, lines 64-67, col.6, lines 1-16).

12. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Felix et al. (5,946,356) in views of Yoshida (5,953,377) and Walton et al. (7,002,900), as applied

to claim 1 above, and further in view of Rezvani et al. (6,976,202) (hereinafter, Rezvani).

13. As per claim 4, Felix, Yoshida & Walton teach all the limitations in the previous claim on which claim 4 depends but they fail to disclose reduction in peak to average ratio.

Rezvani teaches reduction in peak to average ratio (figure 6A, col.11, lines 34-43) which is has functional equivalency to claim limitations of 'masking the data to reduce its peak to average ratio'.

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Rezvani into Felix, Yoshida & Walton in order to improve the system integrity without re-transmission of data corrupted or lost in the communication medium as taught by Rezvani (col.3, lines 40-47).

14. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Felix et al. (5,946,356) in views of Yoshida (5,953,377) & Walton et al. (7,002,900), as applied to claim 1 above, and further in view of Venkatesh et al. (2004/0240486) (hereinafter, Venkatesh).

15. As per claim 6, Felix, Yoshida & Walton teach all the limitations in the previous claim on which claim 6 depends but they fail to disclose IEEE 802.11 standards.

Venkatesh teaches, 'data is encoded using an IEEE 802.11 standard a and IEEE 802.11 standard g encoder' (page # 1, paragraphs # 0001 & 0002) (it is noted that in the mentioned paragraphs Venkatesh teaches a wireless communications system that are

defined in IEEE 802.11 and related protocols (claimed IEEE 802.11 standard a and standard g).

It would have been obvious to one of the ordinary skill in the art, at the time invention was made, to implement the teachings of Venkatesh into Felix, Yoshida & Walton in order to have the wireless communications system compatible with the IEEE 802.11 protocols as taught by Venkatesh (paragraphs # 0001 & 0007).

16. Claims 8, 9, 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pauls (5,983,382) in view of Yoshida (5,953,377) and further in view of Wallace et al. (6,473,467) (hereinafter, Wallace).

17. Claim 8 is rejected under the same rationale as mentioned in the rejection of claim 24.

18. Claim 9 is rejected under the same rationale as mentioned in the rejection of claim 26.

19. As per claim 24, in addition to paragraph # 3 above, Pauls teaches two convolutional encoders coupled in series (figure 1) and the data from these encoders are received by receiver 30 (figure 2) (claimed a receiver configured to receive data from two encoders via wireless channel' (figure 1, elements 12, 16, col.5, lines 17-25) (figure 3, element 50)), 'a decoder configured to decode the combined data' (figure 2, col.5, lines 56-67, col.6, lines 1-11). It is also noted that the convolutional encoders have 1/2 rate and 4/5 rate associated with (figure 1, col.4, lines 29-59).

Pauls does not disclose repetition encoder and combiner.

Yoshida teaches, 'a data combiner configured to combine the repetition encoded

data to produce combined data' (figure 12, element 95). Yoshida also teaches a repetition encoder 81 (figure 9) which has 1/r rate associated with repetition encoding process (col.9, lines 46-51) (claimed 'repetition encoder').

It would have been obvious to one of the ordinary skill in the art, at the time invention was made, to replace one of Pauls convolutional encoders by Yoshida's repetition encoder according to ones' design choice and implement the teachings of Yoshida into Pauls in order to form two transmission channels having different bit error rates by using the combiner in the circuit thus increase the coding gain while flexibly adapting to the format of the transmission information as taught by Yoshida (col.12, lines 8-21) and optimize BER performance over a fading channel, with a high efficiency and reasonable delay (col.3, lines 41-49) by successively generating r-bit code words by using repetition encoding circuitry (col.9, lines 46-51) thus enhance system performance.

Pauls and Yoshida do not teach FFT.

Wallace teaches processing the data by transforming into frequency domain information (figure 6, elements 614A-614R) which is received from encoding circuitries (figure 3, col.24, lines 26-53) (claimed a Fast Fourier Transform (FFT) configured to process the received encoded data, wherein time information is transformed into frequency domain information). Wallace also teaches combiner before IFFT (figure 3, elements 334 & 320A) and after FFT (figure 6, elements 614A-614R, 620) (claimed 'combining is performed in the time domain after processing by the FFT), 'decoder configured to decode the combined data' (figure 6, elements 620, 640A).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Wallace into Pauls and Yoshida in order to provide rapid determination of the channel characteristics and prevent the system from degrading as taught by Wallace (col.2, lines 9-22).

20. As per claim 25, Pauls discloses, 'a deinterleaver configured to deinterleave the combined data' (figure 2, element 34, col.5, lines 56-60).

21. As per claim 26, Pauls teaches, 'a Viterbi decoder' (figure 4, element 118, col.7, lines 3-8).

22. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pauls (5,983,382) in views of Yoshida (5,953,377) & **Wallace et al. (6,473,467)**, as applied to claims 8 & 24 above, and further in view of Rezvani et al. (6,976,202) (hereinafter, Rezvani).

23. As per claim 15, Pauls, Yoshida & Wallace teach all the limitations in the previous claim on which claim 15 depends but they fail to disclose compensation for the effect of subchannel.

Rezvani teaches encoding of data in order to compensate the effect of interference on the subchannels in frequency domain (col.1, lines 62-67, col.2, lines 1-9 & 23-32) which reads on claim limitations of 'combining the repetition encoded data to produce combined data includes compensating for the effect of each subchannel'.

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Rezvani into Pauls, Yoshida & Wallace in

order to separate data from noise in a received signal as taught by Rezvani (col.1, lines 67, col.2, lines 1-7) thus increase system reliability.

24. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pauls (5,983,382) in views of Yoshida (5,953,377) & Wallace et al. (6,473,467), as applied to claims 8 & 24 above, and further in view of Venkatesh et al. (2004/0240486) (hereinafter, Venkatesh).

25. As per claim 13, Pauls, Yoshida & Wallace teach all the limitations in the previous claim on which claim 13 depends but they fail to disclose IEEE 802.11 standard.

Venkatesh teaches, 'encoding conforms to the IEEE 802.11 standard a and IEEE 802.11 standard g convolutional encoding' (page # 1, paragraphs # 0001 & 0002) (it is noted that in the mentioned paragraphs Venkatesh teaches a wireless communications system that are defined in IEEE 802.11 and related protocols (claimed IEEE 802.11 standard a and standard g).

It would have been obvious to one of the ordinary skill in the art, at the time invention was made, to implement the teachings of Venkatesh into Pauls, Yoshida & Wallace in order to have the wireless communications system compatible with the IEEE 802.11 protocols as taught by Venkatesh (paragraphs # 0001 & 0007).

26. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pauls (5,983,382) in views of Yoshida (5,953,377) & Wallace et al. (6,473,467), as applied to claims 8 & 24 above, and further in view of Bruckert et al. (5,822,359) (hereinafter, Bruckert).

27. As per claim 14, Pauls, Yoshida & Wallace teach all the limitations in the previous claim on which claim 14 depends but they fail to disclose deinterleaving before combining the data.

Bruckert teaches, 'deinterleaving the data before combining the data' (figure 1, elements 162 & 166, col.9, lines 64-67, col.10, lines 1-4 & lines 17-30).

It would have been obvious to one of the ordinary skill in the art, at the time invention was made, to implement the teachings of Bruckert into Pauls, Yoshida & Wallace in order to combine the input data samples into a composite stream of coherently detected data samples as taught by Bruckert (col.9, lines 40-44) thus increase system performance.

28. Claims 16 & 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pauls (5,983,382) in views of Yoshida (5,953,377) & Wallace et al. (6,473,467), as applied to claims 8 & 24 above, and further in view of Anim-Appiah et al. (2004/0100898) (hereinafter, Appiah).

29. As per claims 16 & 17, Pauls, Yoshida & Wallace teach all the limitations in the previous claim on which claims 16 & 17 depend but they fail to disclose weighting data for different subchannels and channel quality estimation.

Appiah sums the gain estimates for each subchannel having data which are being used to calculate the channel quality metric for the subchannels (figure 1, element 134, figure 2, element 216, paragraph # 0035) (claimed 'weighting data received on different subchannels according to the quality of the subchannels'). Furthermore, Appiah calculates the channel quality metric M (paragraph # 0034, page # 3, equation

3) for each sub-channel which includes noise-plus-interference power Pni and formula to calculate Pni includes long sequence binary phase keyed symbol (page # 5, equation 2, paragraphs # 0036 & 0040) (claimed 'aggregate channel quality estimation is made for bits') & Appiah is recovering the data sequence by using the Viterbi algorithm (page # 4, paragraph # 0034) (claimed 'Viterbi to determine a maximum likely transmitted data sequence').

It would have been obvious to one of the ordinary skill in the art, at the time invention was made, to implement the teachings of Appiah into Pauls, Yoshida & Wallace in order to provide timely estimates of channel quality by calculating channel quality metric thus increase the reliability for channel assessment for wireless communications as taught by Appiah (paragraph # 0021).

30. Claims 18 & 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pauls (5,983,382) in views of Yoshida (5,953,377) & Wallace et al. (6,473,467), as applied to claims 8 & 24 above, and further in view of Zehavi et al. (6,148,042) (hereinafter, Zehavi).

31. As per claims 18 & 19, Pauls, Yoshida & Wallace teach all the limitations in the previous claim on which claims 18 &19 depend but they fail to disclose determinations of phase offset and hard decision.

Zehavi determines a phase offset in order to minimize the processing associated with projection and scaling of the decision data (figure 2, figure 5, elements 111, 112 & 116, col.6, lines 5-29). Moreover, he calculates the coherent hard index values in order to increase the accuracy for generating the reference signals for determining the phase

offset (figure 5, elements 112, 116, 118 & 130, col.6, lines 50-61) which reads on claims limitations of 'estimating a phase offset using the received repetition encoded data by making a hard decision and determining a hard decision corrected signal'.

It would have been obvious to one of the ordinary skill in the art, at the time invention was made, to implement the teachings of Zehavi into Pauls, Yoshida & Wallace in order to increase the accuracy of the received signal as taught by Zehavi (col.6, line s57-61) thus enhance system reliability.

32. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pauls (5,983,382) in views of Yoshida (5,953,377), Wallace et al. (6,473,467) and Zehavi et al. (6,148,042), as applied to claims 8, 18, 19 & 24 above, and further in view of Wishchermann (5,148,278).

33. As per claim 20, in addition to aforementioned rejections of claims 18 & 20, Pauls, Yoshida, Wallace and Zehavi teach all the limitations in the previous claim on which claim 20 depends but they fail to disclose median filter.

Wishchermann discloses median filter (col.6, lines 39-55).

It would have been obvious to one of the ordinary skill in the art, at the time invention was made, to implement the teachings of Wishchermann into Pauls, Yoshida, Wallace & Zehavi in order to self-adapt the signal and find the output value in the collection of similar input values as taught by Wishchermann (col.6, lines 39-55).

34. Claims 12, 27 & 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pauls (5,983,382) in views of Yoshida (5,953,377), Wallace et al. (6,473,467) &

Zehavi et al. (6,148,042), as applied to claims 19 & 24 above, and further in view of Takeda et al. (2001/0034871) (hereinafter, Takeda).

35. As per claims 12 & 27, in addition to aforementioned rejection of claim 19, Pauls, Yoshida, Wallace & Zehavi teach all the limitations in the previous claim on which claim 27 depends but they fail to disclose mask remover.

Takeda teaches, 'mask remover' (paragraphs # 0089 & 0138) (it is noted that Takeda is removing the mask symbols from a Reed-Muller code and also reads on claim 12 limitations as well because Reed-Muller code could be replaced by pseudorandom codes).

It would have been obvious to one of the ordinary skill in the art, at the time invention was made, to implement the teachings of Takeda into Pauls, Yoshida, Wallace & Zehavi in order to increase the minimum Euclidean distance without lowering the transmission rate by adding mask symbols while transmitting the data and removing the mask symbols while decoding them as taught by Takeda (paragraphs # 0003 & 0089).

36. Claim 28 is rejected under the same rationale as mentioned in the rejection of claim 19 above.

Contact Information

37. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Naheed Ejaz whose telephone number is 571-272-5947. The examiner can normally be reached on Monday - Friday 8:00 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on 571-272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Naheed Ejaz
Examiner
Art Unit 2611

NE
8/31/2007

CHIEH M. FAN
SUPERVISORY PATENT EXAMINER